Green sulfur photosynthetic bacteria typically live in anoxic, sulfur-rich water or sediments where the light levels are extremely low. Unlike plants which perform photosynthesis in chloroplasts, these bacteria have evolved a sophisticated antenna complex, called the chlorosome, that allows them to thrive in an extremely light-limited environment. The large peripheral chlorosome absorbs light, and that energy is then transferred to the main photosynthetic reaction center via the membrane-attached Fenna-Matthews-Olson (FMO) antenna protein. FMO consists of three identical subunits, each containing seven bacteriochlorophyll pigments. Given the critical “linker” role of this protein in energy transfer, a detailed understanding of FMO protein structure, especially its orientation relative to other components in the energy transfer process, is an important goal of current research. In an article in the April 14, 2009, issue of the *Proceedings of the National Academy of Sciences* (**106,** 6134-9), Dr. Robert Blankenship and colleagues from Washington University in St. Louis deduced the orientation of the FMO protein relative to the reaction center and neighboring membranes by using a clever combination of chemical labeling and mass spectroscopy. This new approach provided a “surface map” of FMO and revealed that the side of FMO containing the energy pigment with the lowest potential energy is oriented nearest to the reaction center, consistent with theoretical predictions. Besides increasing knowledge of interactions important for energy transfer, the technique developed in this study should find broader utility in protein-protein and protein-membrane interaction studies—anywhere a better understanding of protein orientation is a desired research objective.